

## ABSTRACT

A three-terminal semiconductor transistor device comprises a base region formed by a semiconductor material of a first conductivity type at a first concentration, the base region being in contact with a first electrical terminal via a semiconductor material of the second conductivity type at a second concentration, wherein the second concentration is lower than the first concentration. The three-terminal semiconductor transistor device also includes a conductive emitter region in contact with the semiconductor base region, forming a first Schottky barrier junction at the interface of the conductive emitter region and the semiconductor base region. The conductive emitter region is in contact with a second electrical terminal. The three-terminal semiconductor transistor device further includes a conductive collector region in contact with the semiconductor base region, which forms a second Schottky barrier junction at the interface of the conductive collector region and the semiconductor base region. The conductive collector region is in contact with a third electrical terminal. The tunneling current through the first Schottky barrier junction or the second Schottky barrier junction is substantially controlled by the voltage of the semiconductor base region.